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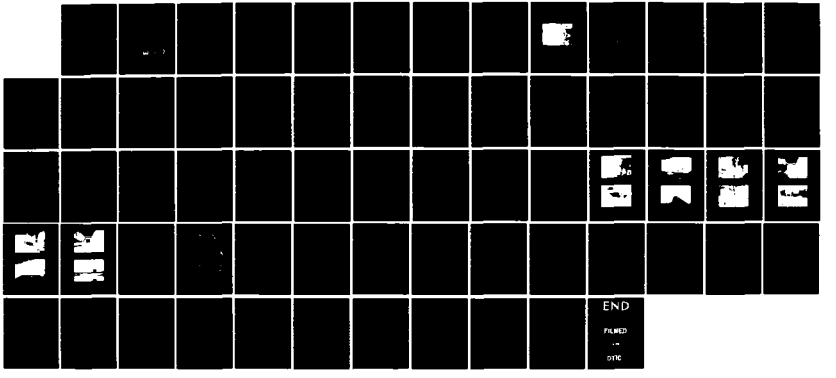

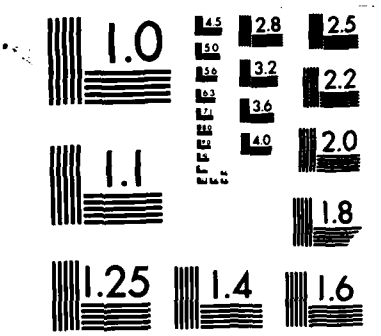

ATLANTIC OCEAN

BELFAST, MAINE

LITTLE RIVER LOWER DAM
ME 00288

STATE NO. 5090

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

NOVEMBER 1979

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
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18. SUPPLEMENTARY NOTES

Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

DAMS, INSPECTION, DAM SAFETY,
Atlantic Ocean
Belfast Maine
Little River

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

The dam is a concrete and dry stone masonry dam with a hydraulic height of 30 ft. and is 126 ft. long. The dam is in fair condition. It is small in size with a hazard potential of significant. A major breach with pool at top of dam would probably result in the loss of no lives, but could cause appreciable damage to property.

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NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

Identification No.:	ME00288
Name of Dam:	Little River Lower Dam
Town:	Belfast
County and State:	Waldo, Maine
Stream:	Little River
Date of Inspection:	September 17, 1979

BRIEF ASSESSMENT

Little River Lower Dam is a concrete and dry-stone-masonry dam, with a hydraulic height of 30 feet, 126 feet long, with a 91-foot long concrete ogee spillway section which makes a smooth transition into a slightly sloping spillway apron. At its downstream end the spillway apron discharges over a vertical dry-stone-masonry wall about 11 feet high. At the south end of the dam there is a concrete retaining wall. At the north end of the dam there is a massive intake structure which appears to be dry-stone-masonry encased in concrete. A pump station building and a filter house for a water supply system is located integrally with the north abutment. The gate mechanism on the north abutment is in poor condition and hasn't been operational for over 24 years. The dam impounds a reservoir with a maximum storage capacity of about 615 acre-feet. The reservoir is .51 mile long with a surface area of about 37 acres and is used for water supply for the Town of Belfast.

The dam is in fair condition. Major concerns are: Erosion on the upstream and downstream sides of the south concrete abutment, and deterioration of the dry-stone-masonry walls at the downstream edge of the spillway apron, on the north bank of the upstream channel and on the north bank of the downstream channel.

Based on small size and significant hazard classification in accordance with Corps guidelines, the test flood ranges from ¼ to ½ the Probable Maximum Flood (PMF). Because the storage capacity of this reservoir is in the upper range of the size classification, ½ PMF was selected as the test flood. Using the COE guide curves with 'mountainous' terrain, and the ½ PMF routed outflow from the Little River Upper Dam, the test flood inflow was determined to be 15,920 cfs. After routing, the test flood discharge was determined to be 15,000 cfs at elevation 36.7' NGVD. The test flood analysis indicates the dam would be overtopped by 6.4 feet. Spillway capacity at top of dam is 3,665 cfs, which is 24 percent of the routed test flood discharge. A major breach with pool at top of dam would probably result in the loss of no lives, but could cause appreciable property damage. (For details see Section 5.1 f.)

The owner, Belfast Water District, should implement the results of the recommendations and remedial measures given in Sections 7.2 and 7.3 within one year after receipt of this Phase I Inspection Report.

Warren A. Guinan
Project Manager
N.H. P.E. 2339

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF:
NEDED

JUL 07 1980

Honorable Joseph E. Brennan
Governor of the State of Maine
State Capitol
Augusta, Maine 04330

Dear Governor Brennan:

Inclosed is a copy of the Little River Lower Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Agriculture cooperating agency for the State of Maine. In addition, a copy of the report has also been furnished the owner, Belfast Water District, 71 Church Street, Belfast, Maine 04915.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Agriculture for your cooperation in carrying out this program.

Sincerely,

MAX B. SCHEIDER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

This Phase I Inspection Report on Little River Lower Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

ARAMAST MAHTESIAN, MEMBER
Geotechnical Engineering Branch
Engineering Division

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

RICHARD DIBUONO, CHAIRMAN
Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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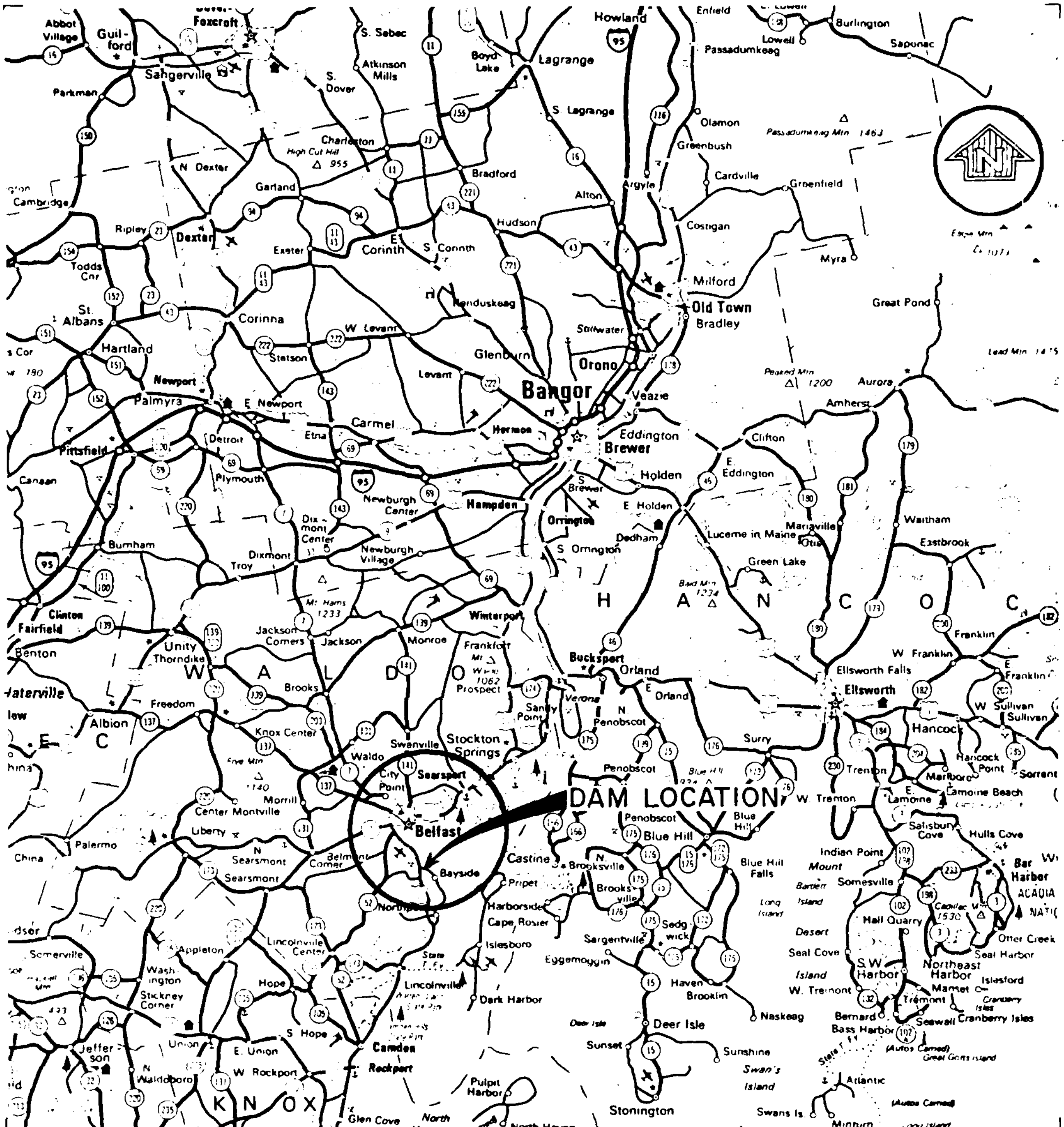
REPORT

APPENDICES

October, 1979

Figure 1 - Overview of Little River Lower Dam.



SCALE IN MILES

0 10 20

MAP BASED ON 1979-1980 OFFICIAL TRANSPORTATION MAP, STATE OF MAINE

Anderson-Nichols & Co., Inc CONCORD NEW HAMPSHIRE	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MA

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

LITTLE RIVER LOWER DAM
LOCATION MAP

LITTLE RIVER MAINE

			SCALE SEE BAR SCALE
			DATE NOVEMBER 1979

NATIONAL DAM INSPECTION PROGRAM
PHASE 1 INSPECTION REPORT
LITTLE RIVER LOWER DAM

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority. Public Law 92-367, August 8, 1972 authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Anderson-Nichols & Company, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of New Hampshire. Authorization and notice to proceed were issued to Anderson-Nichols under a letter of August 28, 1979 from William E. Hodgson, Colonel, Corps of Engineers. Contract No. DACW33-79-C-0050, as changed, has been assigned by the Corps of Engineers for this work.

b. Purpose

(1) To perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

(2) To encourage and prepare the States to initiate quickly effective dam safety programs for non-Federal dams.

(3) To update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location. Little River Lower Dam, commonly called Lower Dam, is located on the boundary of the Town of Belfast and the Town of Northport, Maine; the dam spans Little River approximately 700 feet upstream from the river's confluence with the Atlantic Ocean. The dam impounds a pond called Belfast Reservoir Number 1. After discharging at the damsite, Little River flows easterly into Penobscot Bay in the Atlantic Ocean. Little River Lower Dam is shown on the U.S.G.S. Quadrangle, Searsport, Maine with coordinates approximately at N 44° 23' 42", W 68° 59' 24", Waldo County, Maine. (See Location Map page vii.)

b. Description of Dam and Appurtenances. Little River Lower Dam is a low, run-of-river dam which impounds a reservoir

of small size. It is a concrete and dry-stone-masonry dam, about 30 feet high (hydraulic) and 126 feet long, with a 91-foot long ogee spillway section which makes a smooth transition into a slightly sloping spillway apron. At its downstream end, the spillway apron discharges over a vertical dry-stone-masonry wall about 11 feet high.

At the south end of the dam there is a concrete retaining wall. The wall extends downstream 36 feet (width of the spillway and apron) then bends at right angle towards south abutment for a distance of 12 feet and then again continues downstream for the next 14 feet. At the downstream side of the concrete retaining wall it can be observed that the wall is founded on bedrock. Soil lies against the upstream and landward sides of the retaining wall. At the north end of the dam there is a massive intake structure which appears to be dry-stone-masonry encased in concrete on the top, upstream face, and river side face. A stone masonry training wall, partially faced with concrete supports the north bank of the upstream approach channel. The training wall extends for 24 feet perpendicular to the spillway and then bends slightly toward the center of the upstream channel to the next 24 feet. On the north bank of the downstream channel there is a concrete-faced dry-stone-masonry wall which, in the lower section, is not faced with concrete. Located in the lower section of the downstream retaining wall is an outlet channel for the intake structure. This outlet is plugged with sand and gravel to about one-third of its height. A pump station building and a filter house for a water supply system is located immediately downstream of the north abutment. A concrete wall which exists on the river side of these buildings is an extension to the downstream retaining wall. The gate operating mechanism on the north abutment is inoperable; the gate size and type is unknown. Its outlet is a 5-foot diameter steel pipe that exits at the bottom of the training wall on the north bank of the downstream channel. The average daily intake through the water supply pump is about 275 gpm.

c. Size Classification. Small (hydraulic height - 30 feet; storage - 615 acre-feet) based on height and storage (height ≥ 25 to < 40 feet and storage ≥ 50 to < 1000 acre-feet) as given in the Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification. Significant hazard. A major breach would probably not result in the loss of lives, but could cause appreciable property damage and loss of the reservoir and water supply of the Town of Belfast. (See Section 5.1 f.)

e. Ownership. Little River Lower Dam is owned by Belfast Water District.

f. Operator. The current owner and operator of the dam is Belfast Water District, 71 Church Street, Belfast, Maine. Telephone: (207) 338-1200.

g. Purpose of Dam. Water impounded at Little River Lower Dam is used as a water supply reservoir.

h. Design and Construction History. The original stone masonry dam was built in 1887 and was breached in 1941. In 1943 a new dam was built about 15 feet downstream of the old dam crest. Some parts of the original dam were used to build the new dam. Gunite patchwork was done on the dam face about two years ago. This historical information was obtained orally from the Belfast Water District Superintendent, Mr. Milford Rhodes, during the visual inspection. No other information regarding the original design or construction of the dam was disclosed.

i. Normal Operating Procedures. No written operational procedures exist for Little River Lower Dam. Operating procedures are restricted to water supply operation. There are two 8-inch pipes leading to a wet well which has one 10-inch supply line. The average daily supply amounts to 275 gpm.

1.3 Pertinent Data

a. Drainage Area. The drainage area consists of 16.8 square miles (10,752 acres) of rolling and partially wooded terrain. 3.1 square miles is intermediate drainage area and 13.7 square miles is drainage for Little River Upper Dam, which is located about 4,900 feet upstream. The normal pool has a surface area of 37 acres which constitutes less than 1 percent of the watershed.

b. Discharge at Damsite

(1) Outlet works (a) - unknown gate size - gate is not now operable

(b) - two 8-inch diameter intake pipes for water supply

(2) The maximum known discharge for this dam was in the 1950's when high water flowed over the abutments and filter house. No elevation for this incident was available.

(3) Ungated spillway capacity @ top of dam elevation - 3,665 cfs @ 30.3' MSL

(4) Ungated spillway capacity @ test flood elevation - 12,018 cfs @ 36.7' MSL

(5) Gated spillway capacity @ top of dam elevation - not applicable

(6) Gated spillway capacity @ test flood elevation - not applicable

(7) Total spillway capacity @ test flood elevation - 12,018 cfs @ 36.7' MSL

VISUAL INSPECTION CHECKLIST
PARTY ORGANIZATION

PROJECT Little River Lower Dam, Me. DATE Sept. 17, 1979

TIME 1300

WEATHER Sunny, hot

W.S. ELEV. U.S. 25' MSl DN.S. 1.3' MSL

PARTY:

1. Warren Guinan (ANCo)
2. Stephen Gilman (ANCo)
3. Leslie Williams (ANCo)
4. John Regan (ANCo)
5. Teresa Sapp (ANCo)
6. Janusz Czyzowski (ANCo)
7. Ronald Hirschfeld (GEI)
8. Milford Rhodes (Bel.Water Dist)
9.
10.

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Hydrology/Hydraulics	L. Williams/J. Czyzowski	
2.	Structural Stability	S. Gilman	
3.	Soils and Geology	R. Hirschfeld	
4.			
5.			
6.			
7.			
8.			
9.			
10.			

APPENDIX A

VISUAL INSPECTION CHECKLIST

(2) Clear the sand and gravel that partially block the discharge end of the low-level outlet pipe.

(3) Inspect visually the dam and appurtenant structures once a month.

(4) Engage a Registered Professional Engineer to make a comprehensive technical inspection of the dam once a year.

(5) Establish a surveillance program for use during and immediately after heavy rainfall and also a warning program to follow in case of emergency conditions.

7.4 Alternatives

None.

SECTION 7
ASSESSMENT, RECOMMENDATIONS, AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. The visual examination indicates that Little River Lower Dam is in fair condition. The major concerns with respect to the integrity of the dam, if left uncorrected, are:

(1) Erosion on the upstream and downstream sides of the south concrete abutment block.

(2) Deterioration of the dry-stone-masonry walls at the downstream edge of the spillway apron, on the north bank of the upstream channel, and on the north bank of the downstream channel.

b. Adequacy of Information. The information available is such that the assessment of this dam must be based primarily on the results of the visual inspection.

c. Urgency. The recommendations made in 7.2 and 7.3 should be implemented by the owner within one year after receipt of this Phase I report.

d. Need for Additional Investigation. No additional investigation for the purposes of this Phase I investigation is needed.

7.2 Recommendations

The owner should engage a Registered Professional Engineer to:

(1) Design and implement repairs for the dry-stone-masonry walls at the downstream edge of the spillway apron, on the north bank of the upstream channel, and on the north bank of the downstream channel.

(2) Design and implement repairs for the erosion on the upstream and downstream sides of the right concrete abutment block.

(3) Design repairs to the low-level outlet gate, operating mechanism, and outlet pipe as required.

7.3 Remedial Measures

a. Operating and Maintenance Procedures. The owner should:

(1) Remove trees and brush from the right bank of the downstream channel between the dam and the highway bridge.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations. Erosion on the upstream and downstream sides of the south concrete abutment shell, if not corrected, could have an adverse effect on the stability of the abutment.

Deterioration of the dry-stone-masonry walls at the downstream edge of the spillway apron, on the north bank of the downstream channel, and on the north bank of the upstream channel, if not corrected, could result in erosion and undermining of the dam and the north abutment.

b. Design and Construction Data. No design and construction data are available.

c. Operating Records. No written operational procedures exist for Little River Lower Dam. Operating procedures are restricted to water supply operation.

d. Post-Construction Changes. See Section 1.2 h.

e. Seismic Stability. This dam is located in Seismic Zone 2 and, in accordance with the Phase I guidelines, does not warrant seismic analysis.

cfs at elevation 36.7' NGVD. The test flood analysis indicates that the dam embankment would be overtopped by approximately 6.4 feet during the test flood conditions. The spillway capacity at top of dam is 3,665 cfs which is 24 percent of the routed test flood discharge. Flow through the water supply pump which averages daily about 275 gpm is insignificant for this study. Because of the inoperable gate condition, overtopping analyses were calculated assuming gate closed.

f. Dam Failure Analysis. The impact of failure of the dam at the top of dam was assessed using the Guidance for Estimating Downstream Dam Failure Hydrographs issued by the Corps of Engineers. The analysis covered the reach extending from the dam to the Atlantic Ocean, a distance of 700 feet along Little River. A major breach of Little River Lower Dam would discharge about 14,780 cfs. The discharge from the dam just prior to failure would be 3,665 cfs or maximum spillway capacity. A breach would cause an increase in stage of 6.3 feet in addition to the 8.2-foot antecedent stage from the dam to the U.S. Route 1 bridge. This increase could cause damage to the water treatment facilities. The U.S. Route 1 bridge would pass the breach discharge without overtopping but this discharge could possibly cause structural damage to the bridge. In the reach from the bridge to the Atlantic Ocean, a distance of 300 feet, an increase in stage of 9 feet in addition to the 10-foot antecedent stage would probably occur. An historic home which also houses a doctor's and optician's office is located on the north bank of the channel just downstream of the U.S. Route 1 bridge. The sill of this home is about 19 feet above channel bottom. Possible damage may occur to this home and the parking lot beside it. The breach could also cause loss of reservoir for use in water supply and therefore poses a hazard to a public utility. There would probably be no loss of life, but it could cause appreciable property damage. Therefore, Little River Lower Dam was classified Significant Hazard.

SECTION 5
HYDROLOGIC/HYDRAULIC

5.1 Evaluation of Features

a. General. Little River Lower Dam is a concrete and dry-stone-masonry dam with an ogee spillway section which makes a smooth transition into a slightly sloping spillway apron. Discharge is over the vertical dry-stone-masonry wall at its downstream end. The dam impounds a reservoir of small size (maximum storage capacity 615 acre-feet) which is used for water supply. The drainage area at the dam consists of 16.8 square miles of mountainous terrain. Reservoir Number 2, impounded by the Upper Dam, is located 0.42 miles upstream. A gate of unknown size is located at the north abutment. The gate mechanism is rusted and not operable. The gate was designed to control discharge through an outlet channel which is plugged with sand and gravel to about one-third of its height. Also at the north abutment, there are two 8-inch intake pipes for the water supply pump. Intake through the water supply pump averages daily about 275 gpm. The reservoir level is controlled by the spillway which is located at the center of the dam.

b. Design Data. No hydrologic or hydraulic experience data were found.

c. Experience Data. No hydrologic or hydraulic experience data were disclosed. Only oral information from the retired Superintendent of the Belfast Water District was available. He described the discharge in the 1950's when high water flowed over the abutments and filter house. No elevation of this incident was available.

d. Visual Observations. At the time of the inspection, no visual evidence was noted of damage to the structure caused by overtopping.

e. Test Flood Analysis. Little River Lower Dam is classified as being small size having a hydraulic height of 30 feet and a maximum storage capacity of 615 acre-feet. The dam was determined to have a significant hazard classification. Using the Recommended Guidelines for Safety Inspection of Dams, the test flood ranged from ¼ to ½ the Probable Maximum Flood (PMF). Because the dam's storage capacity is in the uper end of the size classification, the ½ PMF was chosen as the test flood.

Using the ½ PMF, the test flood inflow for Little River Lower Dam was determined to be 15,920 cfs. The total drainage area is 16.8 square miles, but only 3.1 square miles is intermediate drainage for Little River Lower Dam. Therefore, inflow to Little River Lower Dam is the sum of the routed outflow from Little River Upper Dam and inflow from the intermediate drainage area using the 'mountainous' COE guide curve. The routed outflow value from the Upper Dam was taken from the Little River Upper Dam Phase I inspection report. After routing, the test flood discharge was determined to be 15,000

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures

No written operational procedures exist for Little River Lower Dam. Operating procedures are restricted to water supply operation. There are two 8-inch pipes leading to a wet well which has one 10-inch supply line. The normal daily usage is 275 gpm.

4.2 Maintenance of Dam

The owner, Belfast Water District, is responsible for the maintenance of the dam.

4.3 Maintenance of Operating Facilities

No formal maintenance procedure was disclosed. The Superintendent of the Belfast Water District reported that the low-level gate mechanism is inoperable and has not been operated for over 24 years. Maintenance facilities apply to the water supply station. Someone from the Belfast Water District is on duty at the dam site in the daytime during the weekdays.

4.4 Description of Any Warning System in Effect

No written warning system exists for the dam.

4.5 Evaluation

Formal operational and maintenance procedures should be developed to ensure that problems that are encountered can be remedied within a reasonable period of time.

the approximately 8-inch thick concrete cap which is severely cracked. (See Appendix C - Figure 9.)

A 5-foot-diameter steel pipe exits at the bottom of the training wall on the north bank of the downstream channel. The outlet of the pipe is plugged with sand and gravel to about one-third of its height. (See Appendix C - Figure 9.) The gate mechanism on the north abutment is inoperable; the gate size is unknown. (See Appendix C - Figure 4.) The mechanism is in poor condition with no indication of maintenance. A pump station building and a filter house for a water supply system is located integrally with the north abutment. A concrete wall which exists on the river side of these buildings is an extension to the downstream retaining wall. (See Appendix C - Figure 10.)

d. Reservoir Area. The watershed above the reservoir is rolling and partially wooded. (See Appendix C - Figure 11.) No structures were observed on the shore of the reservoir. No evidence of significant sedimentation in the reservoir was observed.

e. Downstream Channel. The downstream channel is bedrock. Trees overhang the south side of the channel. About 400 feet downstream of the dam is the U.S. Route 1 bridge that crosses the channel. (See Appendix C - Figure 12.) Little River discharges into Penobscot Bay through a channel lined with well-placed derrick stone. (See Appendix C - Figure 13.)

3.2 Evaluation

Based on the visual inspection, Little River Lower Dam is in fair condition. Erosion on the upstream and downstream sides of the south concrete abutment shell, if not corrected, could have an adverse effect on the stability of the abutment.

Deterioration of the dry-stone-masonry walls at the downstream edge of the spillway apron, on the north bank of the downstream channel, and on the north bank of the upstream channel, if not corrected, could result in erosion and undermining of the dam and the north abutment. Also, cracked concrete cap on the lower part of north abutment poses a dangerous condition to people walking on the top of the wall.

The inoperable gate and low-level outlet provides no means of draining the reservoir.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. General. Little River Lower Dam is a low, run-of-river dam which impounds a reservoir of small size. The watershed above the reservoir is rolling and partially wooded. Little River discharges into Penobscot Bay about 700 feet downstream of the dam.

b. Dam. Little River Lower Dam is a concrete and dry-stone-masonry dam, about 30 feet high (hydraulic) and 126 feet long, with a 91-foot long ogee spillway section which makes a smooth transition into a slightly sloping spillway apron. At its downstream end, the spillway apron discharges over a vertical dry-stone-masonry wall about 11 feet high. (See Appendix C - Figure 2.) This vertical dry-stone-masonry wall has two openings, but it cannot be determined from the visual inspection whether these openings are built into the original wall or whether they are the result of blocks of rock having fallen out.

At the north end of the dam there is a massive intake structure which appears to be dry-stone-masonry encased in concrete on the top, upstream face, and river-side face. (See Appendix C - Figures 3 & 4.) The downstream face is dry-stone-masonry. (See sketch plan, Appendix B.)

At the south end of the dam there is a concrete abutment shell. (See Appendix C - Figure 5.) Bedrock is exposed at the downstream side of the concrete abutment. (See Appendix C - Figure 6.) Soil rests against both the upstream and landward sides of the concrete abutment shell. (See Appendix C - Figure 7.) Minor erosion is occurring in the soil immediately adjacent to the upstream side of the concrete abutment shell. Major erosion and sloughing of the soil cover, down to bedrock, is occurring immediately adjacent to the downstream side of the shell. (See Appendix C - Figure 6.) A weephole is located on the downstream face of this shell and it was discharging a small amount of water at the time of the inspection.

c. Appurtenant Structures. A stone masonry training wall, partially faced with concrete which is in poor condition, supports the north bank of the upstream approach channel. (See Appendix C - Figure 8.)

On the north bank of the downstream channel there is a concrete-faced dry-stone-masonry wall. The lower, dry-stone-masonry section of the wall is in poor condition and several blocks of rock are missing from the wall. This causes lack of support to

SECTION 2
ENGINEERING DATA

2.1 Design

No design data were disclosed for Little River Lower Dam.

2.2 Construction

No construction records were disclosed.

2.3 Operation

No engineering operational data were obtained.

2.4 Evaluation

a. Availability. No engineering data were available for Little River Lower Dam. Direct contact with the Belfast Water District and a search of the files at the Maine Soil and Water Conservation Commission revealed only a limited amount of information.

b. Adequacy. The final assessments and recommendations of this investigation are based on the visual inspection and the hydrologic and hydraulic calculations.

c. Validity. No engineering data were disclosed to validate.

g. Dam

(1) Type - concrete gravity

(2) Length - 126' (dam embankment)

(3) Height - 31' (structural height)

(4) Top width - 35'

(5) Side slopes - upstream - vertical

- downstream - vertical
(ogee spillway section makes transition into a slightly sloping spillway apron which drops vertically about 11 feet at downstream toe of the dam)

(6) Zoning - not applicable

(7) Impervious core - not applicable

(8) Cutoff - unknown

(9) Grout curtain - unknown

h. Diversion and Regulating Tunnel - not applicable.

i. Spillway

(1) Type - concrete ogee overflow

(2) Length of weir - 91'

(3) Crest elevation - 25' MSL

(4) Gates - none

(5) U/S Channel - Reservoir Number 1; completely open

(6) D/S Channel - Little River for about 700 feet before its confluence with the Atlantic Ocean, rock channel well defined. U.S. Route Number 1 spans the river 400' below the dam.

j. Regulating Outlets - unknown size gate (not operable) with 60-inch diameter steel pipe outlet pipe and channel which is plugged with sand and gravel to about one-third of its height. This outlet exits at the bottom of the retaining wall on the north bank of the downstream channel.

(8) Total project discharge @ test flood elevation - 15,000 cfs @ 36.7' MSL

c. Elevation (feet above MSL; see (6) below)

(1) Streambed at centerline of dam - 0.3 (at downstream toe, 1.0 foot deep pool)

(2) Maximum tailwater - unknown

(3) Upstream valve chamber invert - unknown

(4) Recreation pool - not applicable

(5) Full flood control pool - not applicable

(6) Spillway crest - 25 (estimated from U.S.G.S. Quadrangle sheet)

(7) Design surcharge (original design) - unknown

(8) Top of dam - 30.3

(9) Test flood pool - 36.7

d. Reservoir (miles)

(1) Length of maximum pool - 0.66

(2) Length of spillway crest pool - 0.51

(3) Length of flood control pool - not applicable

e. Storage (acre-feet)

(1) Recreation pool - not applicable

(2) Flood control pool - not applicable

(3) Spillway crest pool - 370

(4) Top of dam - 615

(5) Test flood pool - 910

f. Reservoir Surface (acres)

(1) Recreation pool - not applicable

(2) Flood control pool - not applicable

(3) Spillway crest - 37

(4) Test flood pool - 52

(5) Top of Dam - 46

PERIODIC INSPECTION CHECKLIST

PROJECT Little River Lower Dam, Me. DATE September 17, 1979

PROJECT FEATURE Intake Channel and Structure NAME

DISCIPLINE NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	
Slope Conditions	Good
Bottom Conditions	Not visible beneath lake surface
Rock Slides or Falls	None
Log Boom	None
Debris	None
Condition of Concrete Lining	Not visible beneath lake surface
Drains or Weep Holes	None observed
b. Intake Structure	
Condition of Concrete	Not visible beneath lake surface
Stop Logs and Slots	None

PERIODIC INSPECTION CHECKLIST

PROJECT Little River Lower Dam, ME DATE September 17, 1979

PROJECT FEATURE Control Tower NAME

DISCIPLINE NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER	
a. Concrete and Structural	
General Condition	Fair
Condition of Joints	No indication of movement
Spalling	Numerous surface spalls
Visible Reinforcing	None
Rusting or Staining of Concrete	Only at embedded items
Any Seepage or Efflorescence	None visible
Joint Alignment	Good - no indication of movement
Unusual Seepage or Leaks in Gate Chamber	None visible
Cracks	Numerous minor surface cracks
Rusting or Corrosion of Steel	Only at embedded steel items
b. Mechanical and Electrical	Gate operating mechanism is in poor condition-no indication of maintenance, lubrication or operation. Belfast Water District Superintendent indicated that gate hasn't been operated in 24 years.
Air Vents	
Float Wells	
Crane Hoist	
Elevator	
Hydraulic System	None
Service Gates	Not visible-reported to be steel
Emergency Gates	None
Lightning Protection System	None
Emergency Power System	None
Wiring and Lighting System	Not applicable

PERIODIC INSPECTION CHECKLIST

PROJECT Little River Lower Dam, Me. DATE September 17, 1979

PROJECT FEATURE Outlet Structure and Channel NAME

DISCIPLINE NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of Stone Masonry	North stone masonry wall has several large stones missing from wall.
Rust or Staining	
Spalling	Downstream wall above tailrace is badly spalled and cracked.
Erosion or Cavitation	
Visible Reinforcing	None
Any Seepage or Efflorescence	None
Condition at Joints	Considerable movement where wall is cracked.
Drain holes	One weep hole discharging water in concrete block south abutment.
Channel	
Loose Rock or Trees Overhanging Channel	Brush and a few trees overhanging channel immediately upstream.
Condition of Discharge Channel	Good

PERIODIC INSPECTION CHECKLIST

PROJECT Little River Lower Dam, Me. DATE September 17, 1979

PROJECT FEATURE Spillway Weir NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	
General Condition	Good
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	A few trees
Floor of Approach Channel	Not visible beneath lake surface.
b. Weir and Training Walls	
General Condition of Concrete	Weir-good-only surface erosion of face some erosion of construction joints Training walls-poor-considerable erosion and spalling on faces, south wall cracked with ½" movement.
Rust or Staining	
Spalling	Some on face of weir and retaining walls.
Any Visible Reinforcing	None
Any Seepage or Efflorescence	None visible
Drain Holes	One weep hole discharging water from concrete south-abutment block.
c. Discharge Channel	
General Condition	Good
Loose Rock Overhanging Channel	None, but soil on top of bedrock is eroding immediately downstream of right abutment.
Trees Overhanging Channel	Some trees overhanging right side of channel.
Floor of Channel	Bedrock (phyllite) and chips of decomposed phyllite.
Other Obstructions	Bridge carrying Route 1 across downstream channel.

PROJECT Little River Lower Dam, Me. DATE September 17, 1979

PROJECT FEATURE Reservoir NAME

AREA EVALUATED	REMARKS
Stability of Shoreline	Upstream-good Downstream-phyllite and [illegible] south abutment eroded. A large flood would wash much of the lower south side away.
Sedimentation	Not much ground cover.
Changes in Watershed Runoff Potential	Not visible below water surface None
Upstream Hazards	None
Downstream Hazards	Filter house-bridge-[illegible] post bridge
Alert Facilities	None
Hydrometeorological Gages	Staff gage
Operational & Maintenance Regulations	None posted

APPENDIX B

ENGINEERING DATA

APPLICATION FOR DAM REGISTRATION

Dam Registration Number 5090
Date Received DEC 15 1975 pd
Fee Enclosed 10.00
Quad Sheet Name Castine
Quad Sheet Number A1 16

Location:

County: Waldo
Municipality: Quasi-Municipal Belfast Water District
Name of Dam: Lower Reservoir Dam
Name of Impoundment: Reservoir #1

Ownership:

Name of Owner: Belfast Water District
Address of Owner: 71 Church Street
Belfast, Maine 04915
Telephone Number: 338-1200

Name of Agent: (if different from Owner)
Address:
Telephone Number:

Description of Dam

Type: Arched Concrete
Construction Material: Concrete (Concrete, wood, earth)
Year Originally built: 1944
Year last major repair: 1968
Height: 25 ft.
Width: 175 ft.
Spillway type: open
Spillway Width: 70 ft.
Impounding Capacity: 57,000,000 gallons (Acre-feet)
Drawdown available: 10 (feet)
Fish Passage available?: no
Installed Electrical Generating Cap: ---
Purposes for which stored water is used: Public drinking supply
Most recent inspection by Qualified Engineer (Date): August 1972
Name and Address of Engineer: Dale E. Caruthers - (Deceased)
Masonic Building, Gorham, Maine 04038
Other Permits applicable: ----

SWCC #14

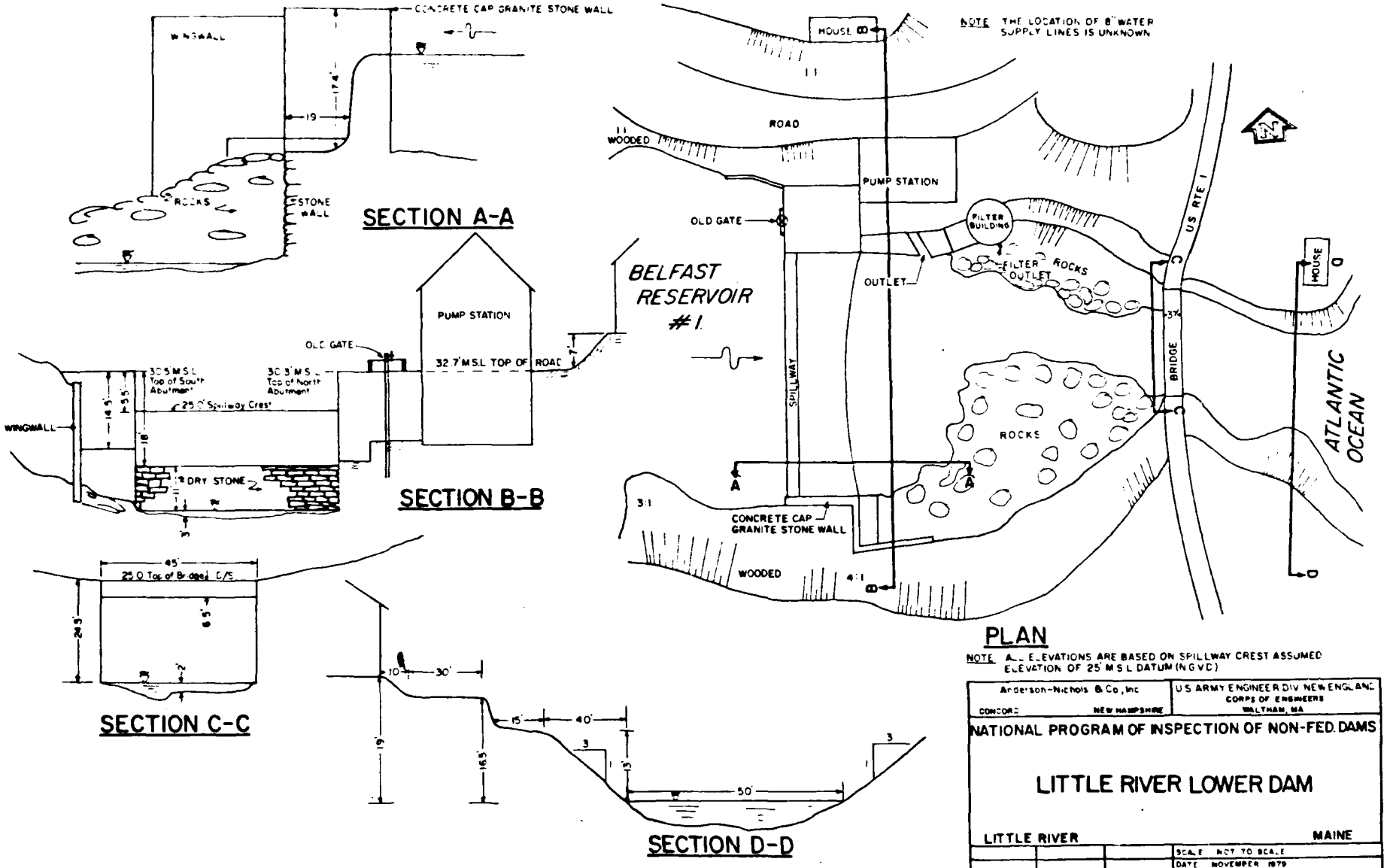
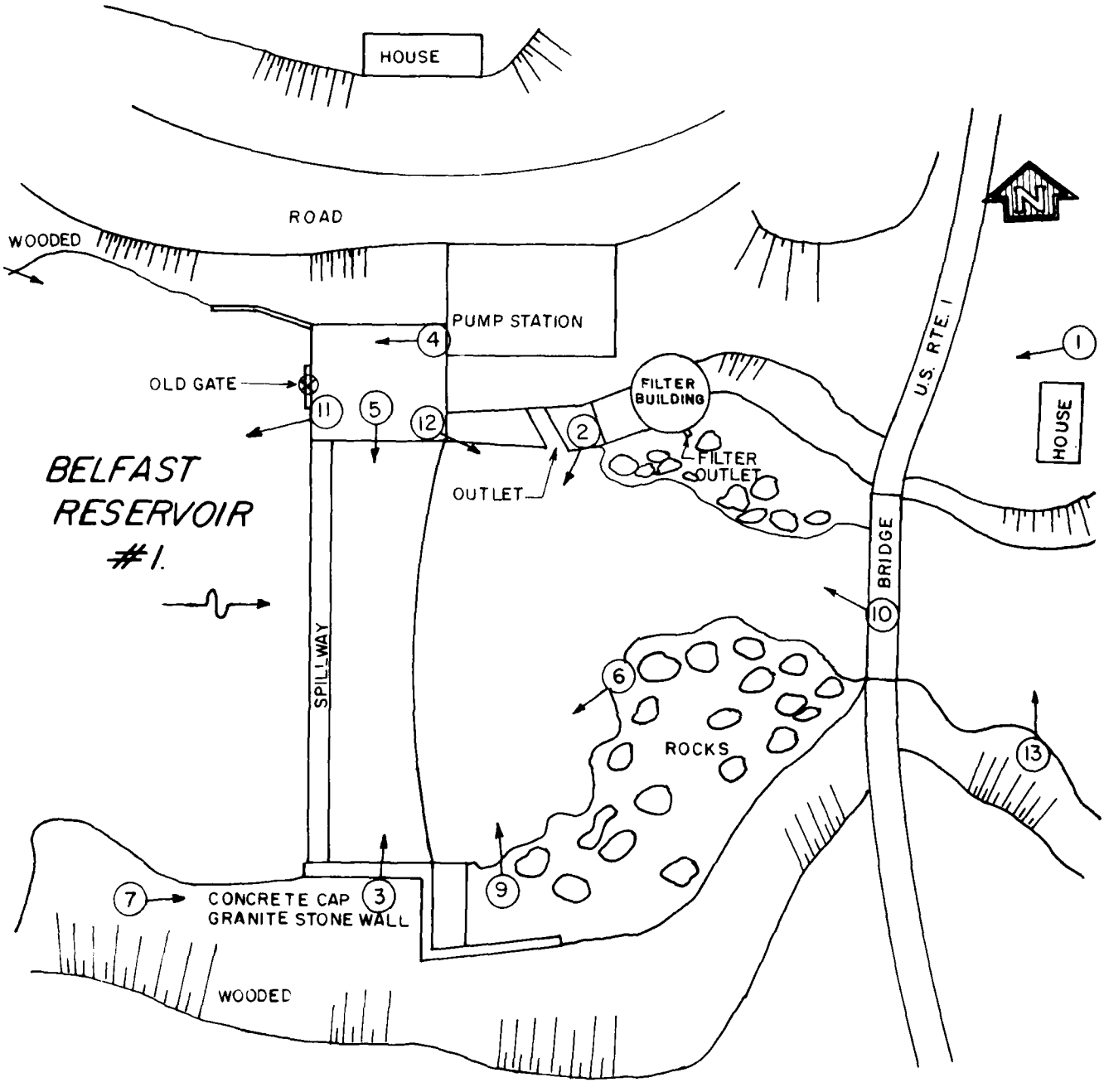


FIGURE B-1

APPENDIX C

PHOTOGRAPHS



Anderson-Nichols & Co, Inc	U.S ARMY ENGINEER DIV. NEW ENGLAND
CONCORD NEW HAMPSHIRE	CORPS OF ENGINEERS WALTHAM, MA.

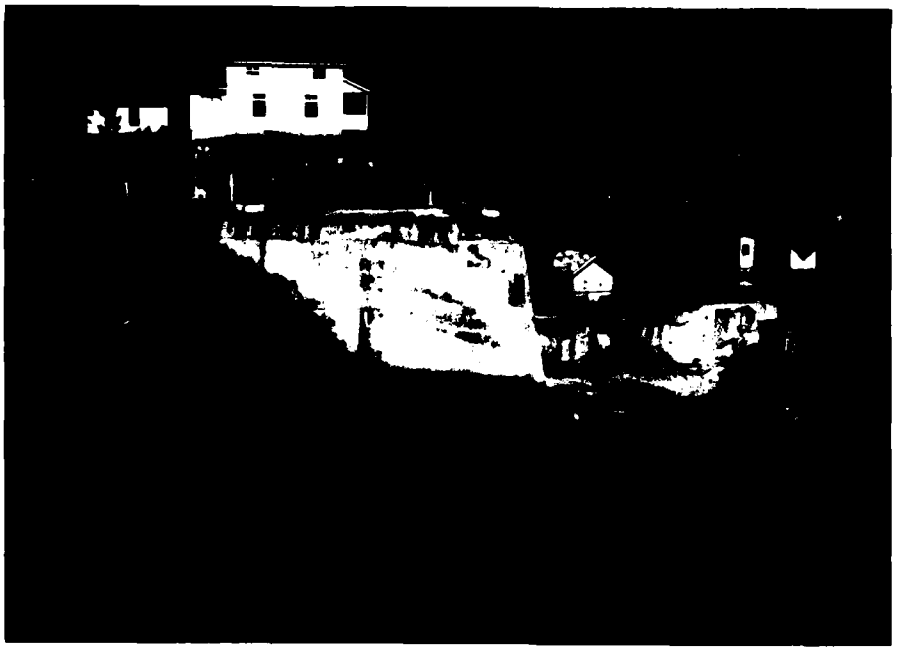
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

PHOTO INDEX

LITTLE RIVER MAINE

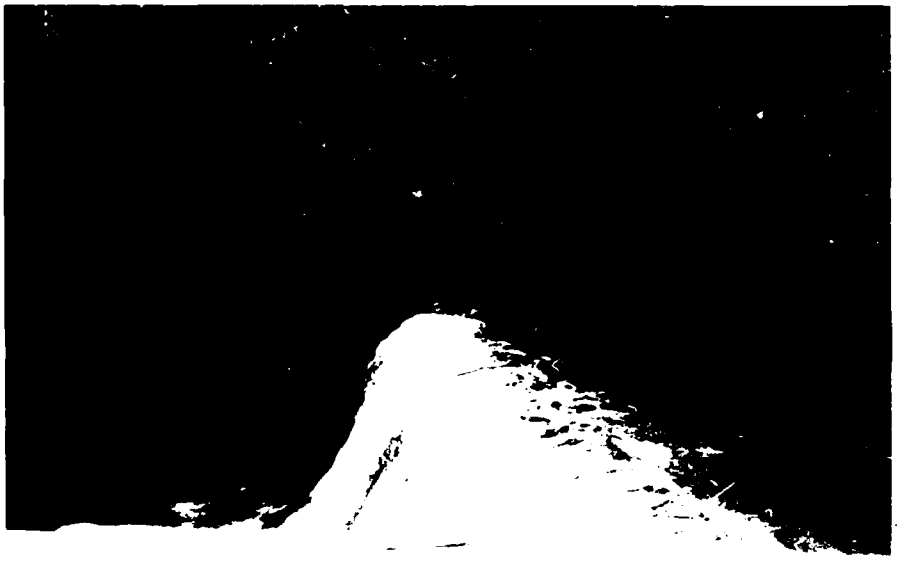
SCALE	NOT TO SCALE
DATE:	NOVEMBER 1979

September 17, 1979
Figure 2 - Downstream face of the dam.



September 17, 1979
Figure 3 - Looking across the crest at north abutment.

September 17, 1979
Figure 4 - Gate mechanism at the north abutment.



September 17, 1979
Figure 5 - Looking across the spillway crest at south abutment.

September 17, 1979

Figure 6 - Downstream face of south abutment of the dam. Note bedrock.

September 17, 1979

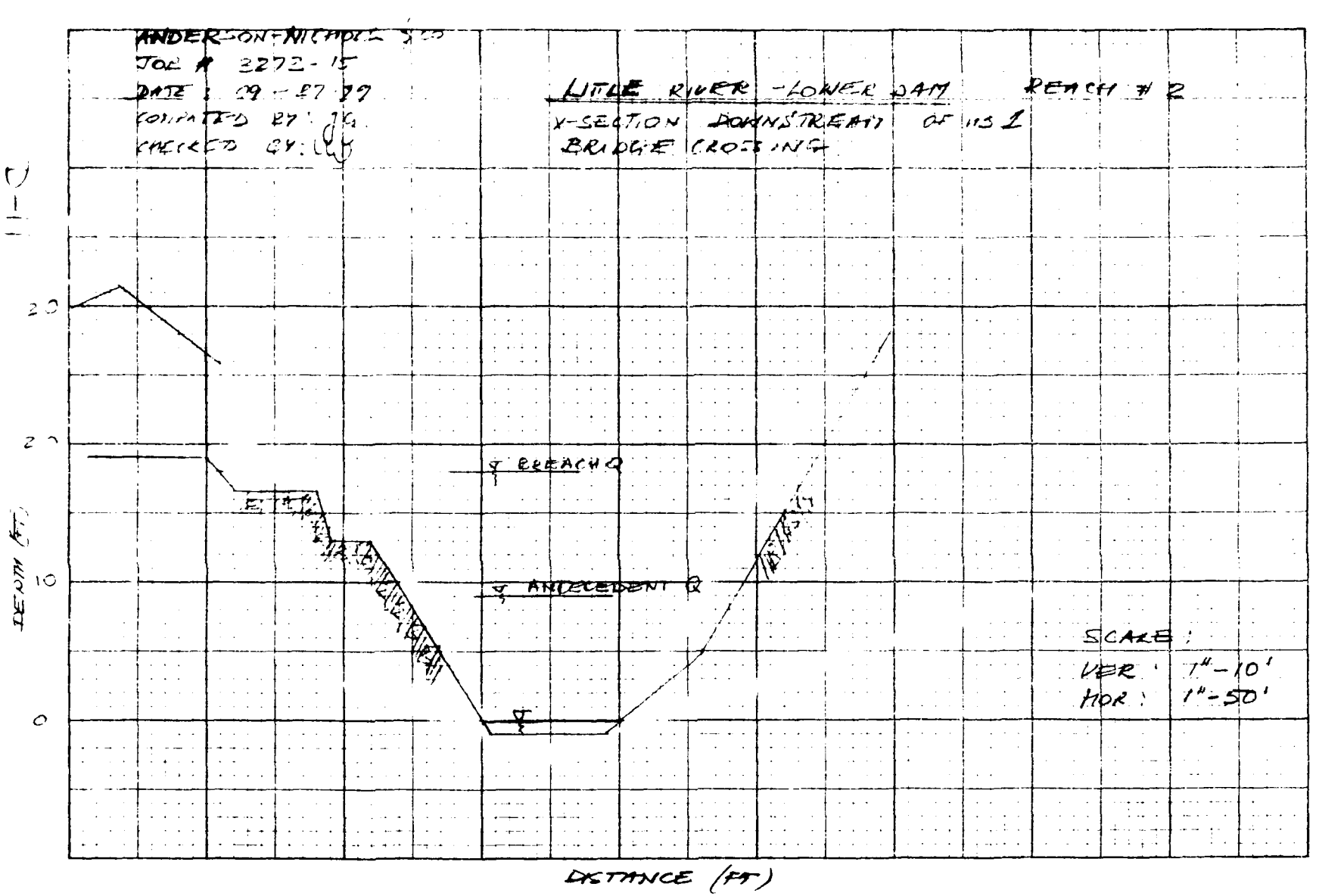
Figure 7 - View of the adjacent earth to the upstream side of south abutment.

September 17, 1979

Figure 8 - View of upstream side of the north abutment.

September 17, 1979

Figure 9 - Dry-stone-masonry wall at north bank of the downstream channel.


ANDERSON-NICHOLS
JOB # 3272-15
DATE: 09-27-99
COMPUTED BY: JG
CHECKED BY:
LITTLE RIVER - LOWER DAM REACH # 2
X-SECTION DOWNSTREAM OF HWY 1
BRIDGE CROSSING
E.T.
REACH Q
ANTECEDENT Q
SCALE:
VER: 1"-10'
HOR: 1"-50'
DEPTH (FT)
20
10
0
DISTANCE (FT)

2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29

LITTLE RIVER - LOWER DAM

BREACH ANALYSIS - CONT'D

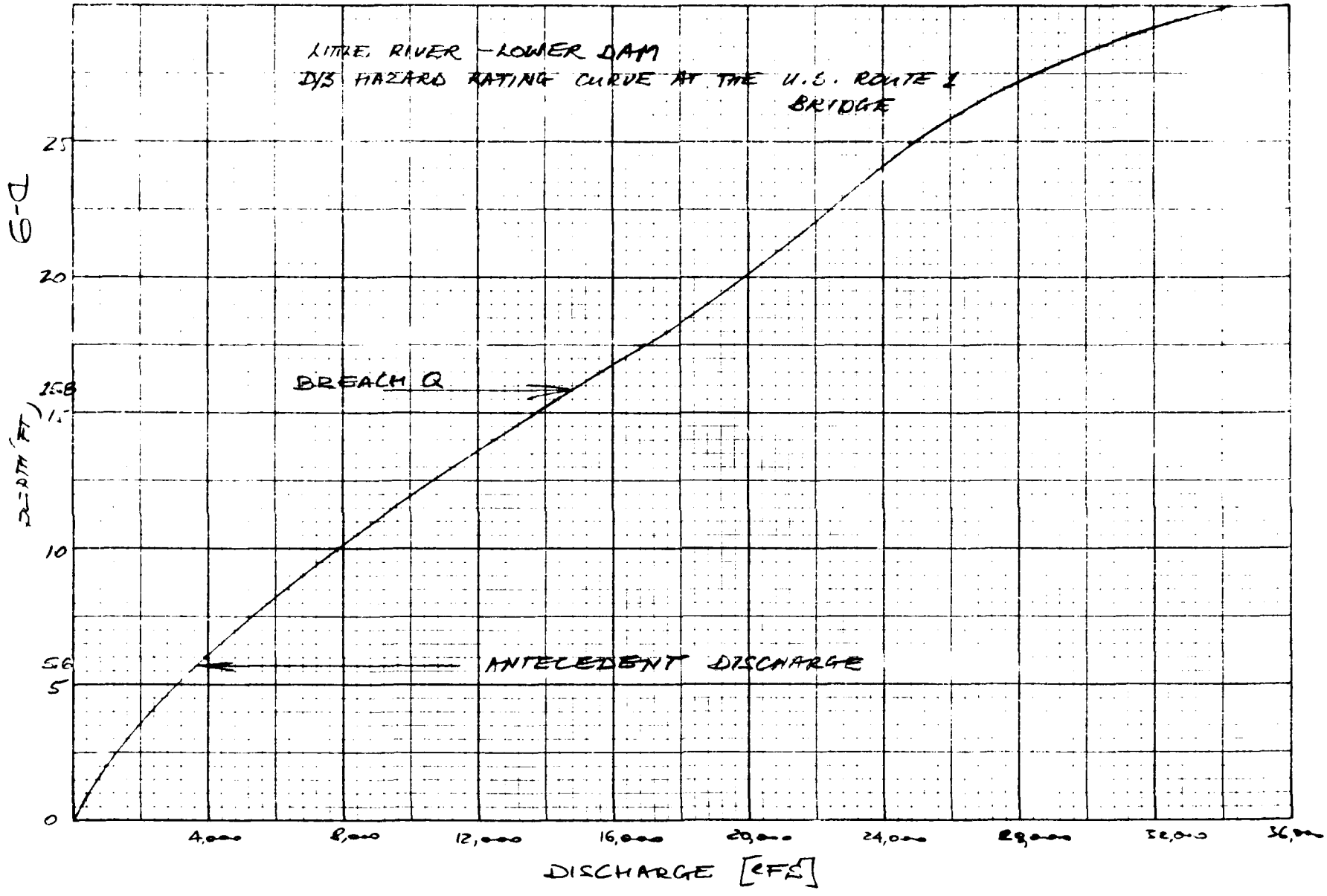
REACH # 2

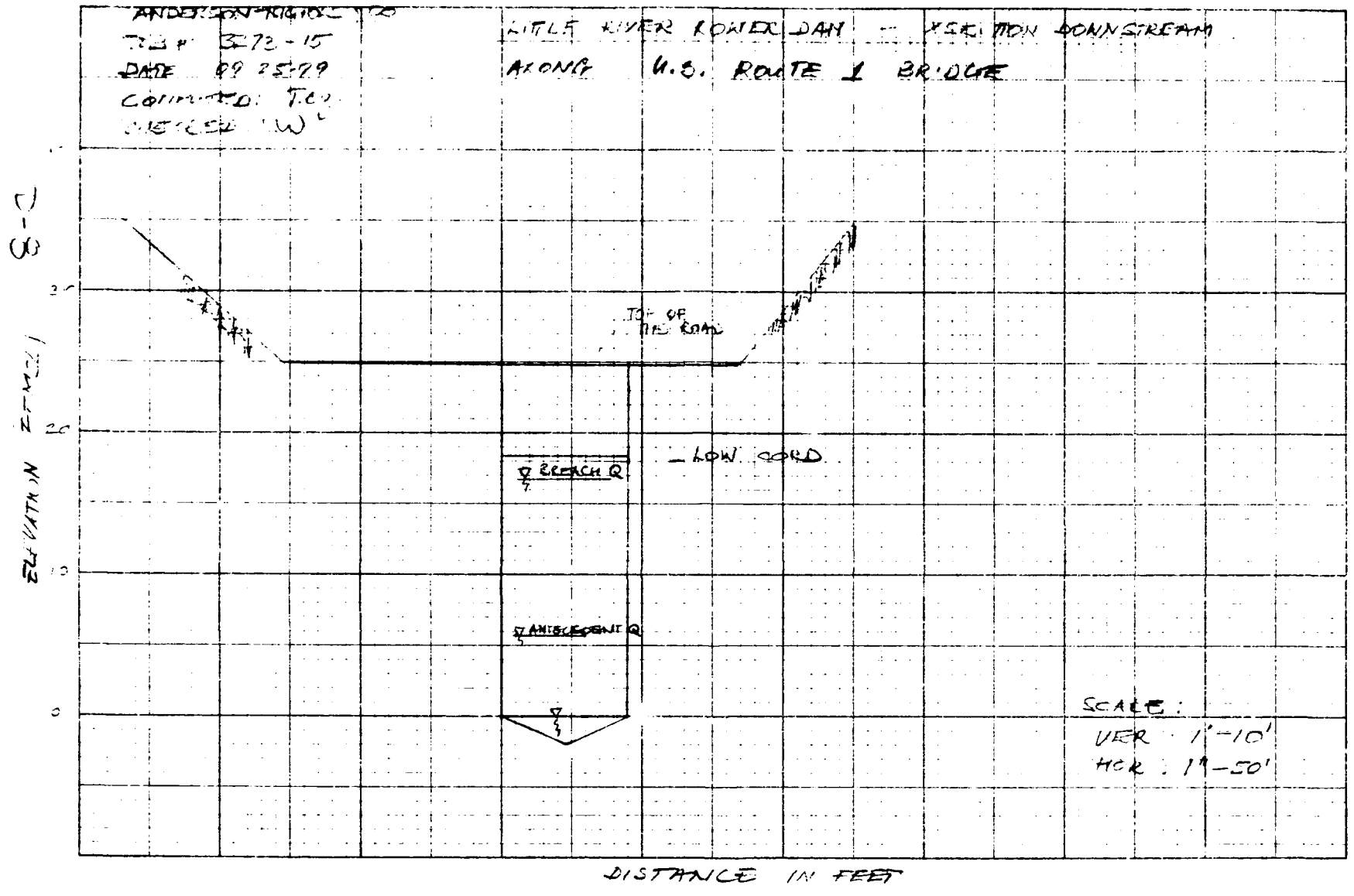
USE A TYPICAL CROSS SECTION ALONG THE DOWN-STREAM REACH FROM THE BRIDGE (XS 1) TO CONFLUENCE WITH ATLANTIC OCEAN FOR A DISTANCE OF 300 FEET.

DEVELOP A RATING CURVE FOR THIS SECTION BY USE OF MANNING'S EQUATION: $Q = \frac{1.49}{n} \times A \times R^{2/3} \times S^{1/2}$

n = .05 S = .0025

DEPTH [FT]	AREA	WPER	Q [CFS]
0	0	0	0
4	242	82	736
8	626	111.	2932
12	1113	137.	6618
16	1720	174.	11648
20	2490	226.	18105


LITTLE RIVER – LOWER DAM
D/S HAZARD RATING CURVE AT THE U.S. ROUTE 1 BRIDGE
BREACH Q
ANTECEDENT DISCHARGE
DEPTH (FT)
25
20
15.8
10
5.6
5
0
4,000
8,000
12,000
16,000
20,000
24,000
28,000
32,000
36,000
DISCHARGE [CFS]


ANDERSON-TRIBOLET
T.L.# 3272-15
DATE 09 25 79
COMPUTED: T.C.
CHECKED: W.
LITTLE RIVER LOWER DAM -- X SECTION DOWNSTREAM
ALONG U.S. ROUTE 1 BRIDGE
C-7
ELEVATION IN FEET
30
20
10
0
TOP OF THE ROAD
BREACH Q
LOW CORD
ANTECEDENT Q
SCALE:
VER 1"=10'
HOR 1"=50'
DISTANCE IN FEET

LITTLE RIVER - LOWER DAM

BREACH ANALYSIS - CONT'D

PRESSURE FLOW - AREA - 855 SQFT C - .92

ELEV. [FT MSL]	H. [FT]	Q = AC √2gH [CFS]
25.	15.5	24,852
27.	17.5	26,407
30.	20.5	28,580
35.	35.5	37,610

WEIR FLOW - C = 2.8

ELEV. [FT MSL]	L [FT]	H [FT]	Q = C·L·H^3/2 [CFS]
25.	0	0	0
27.	170	2	1346.
30.	180	5	5635.
35.	200	10	17709.

SUMMARY - ELEV. [FT MSL]	Q [CFS]
2	1,022
6	3,929
10	7,869
14	12,505
18	17,647
25	24,852
27	27,753
30	34,215
35	55,319

son-Nichols & Company, Inc. Subject HY.IL

Sheet No. ___ Date 10-18-79 Computed ___ Checked LW

JOB NO. 3273-16

LITTLE RIVER LOWER DAM

BREACH ANALYSIS - CONT'D

DEVELOP A RATING CURVE FOR THE X-SECTION ALONG THE U.S. ROUTE 1 BRIDGE 400 FEET DOWNSTREAM THE DAM

LOW FLOW — "C" VALUES: .015 FOR CONC. WALLS
.035 FOR BOTTOM
SLOPE .008

ELEV. (FT MSL)	AREA	[illegible]	Q (CFS)
2	134.7	49.1	1022
6	314.5	57.1	3929
10	494.5	65.1	7,869
14	674.6	73.1	12,505
18	854.9	81.1	17,647

PRESSURE & WEIR FLOW

C - VALUE CALCULATION FOR PRESSURE FLOW:

$K_f = \frac{29.1 \times n^2 \times L}{R^{4/3}}$

$K_f = \frac{29.1 \times .02^2 \times 37}{[illegible]^{4/3}} = .08$

$1.10 + .08 = 1.18$

$K = \frac{1}{C^2} = 1.18$

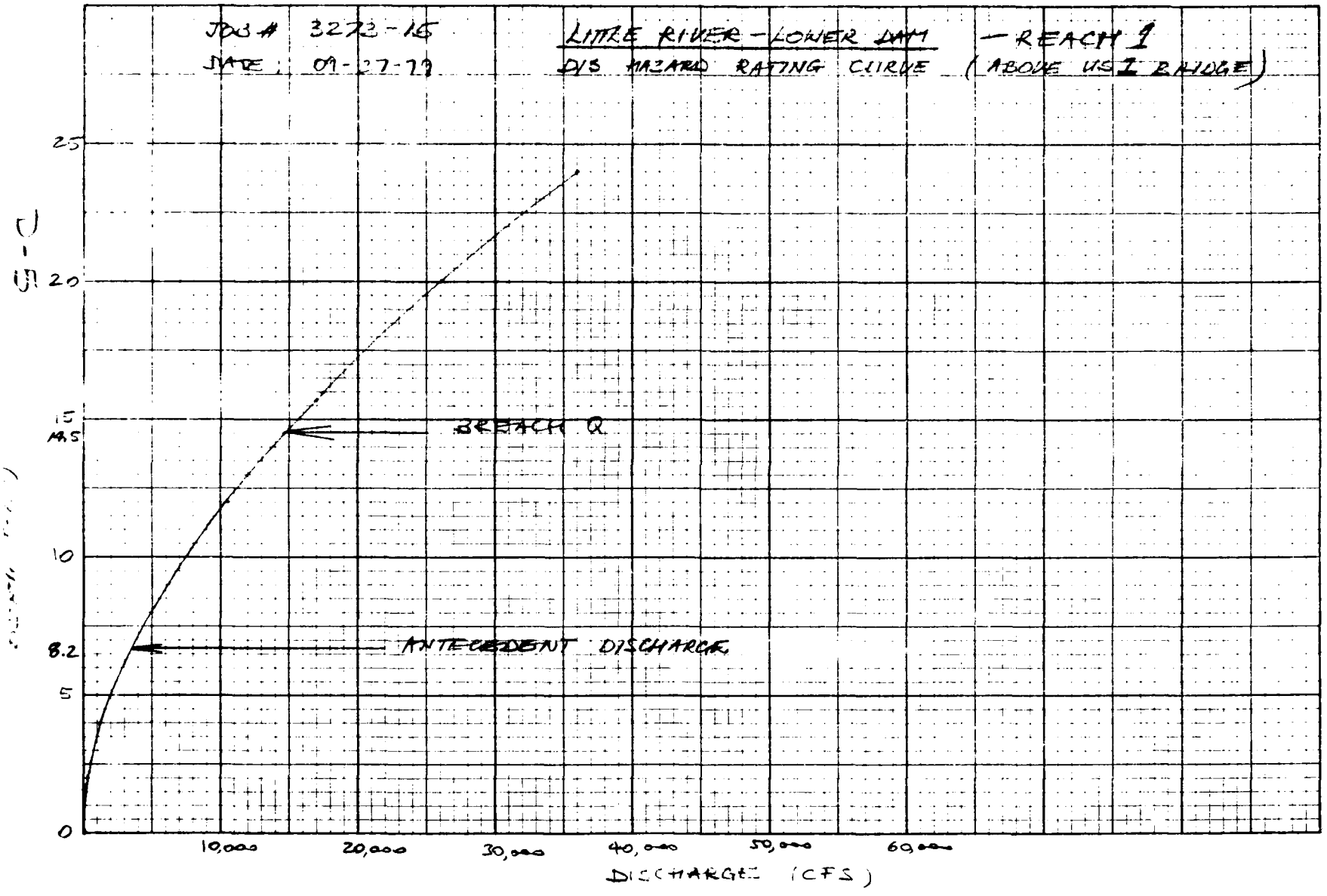
C = .92

L = LENGTH OF [illegible] = 37'
n = FOR CONCRETE BRIDGE [illegible] EARTH BOTTOM = .02
R = HYDRAULIC RADIUS
INTAKE AND EXIT LOSSES = 1.10

D-6

JOB # 3273-15
DATE: 09-27-79

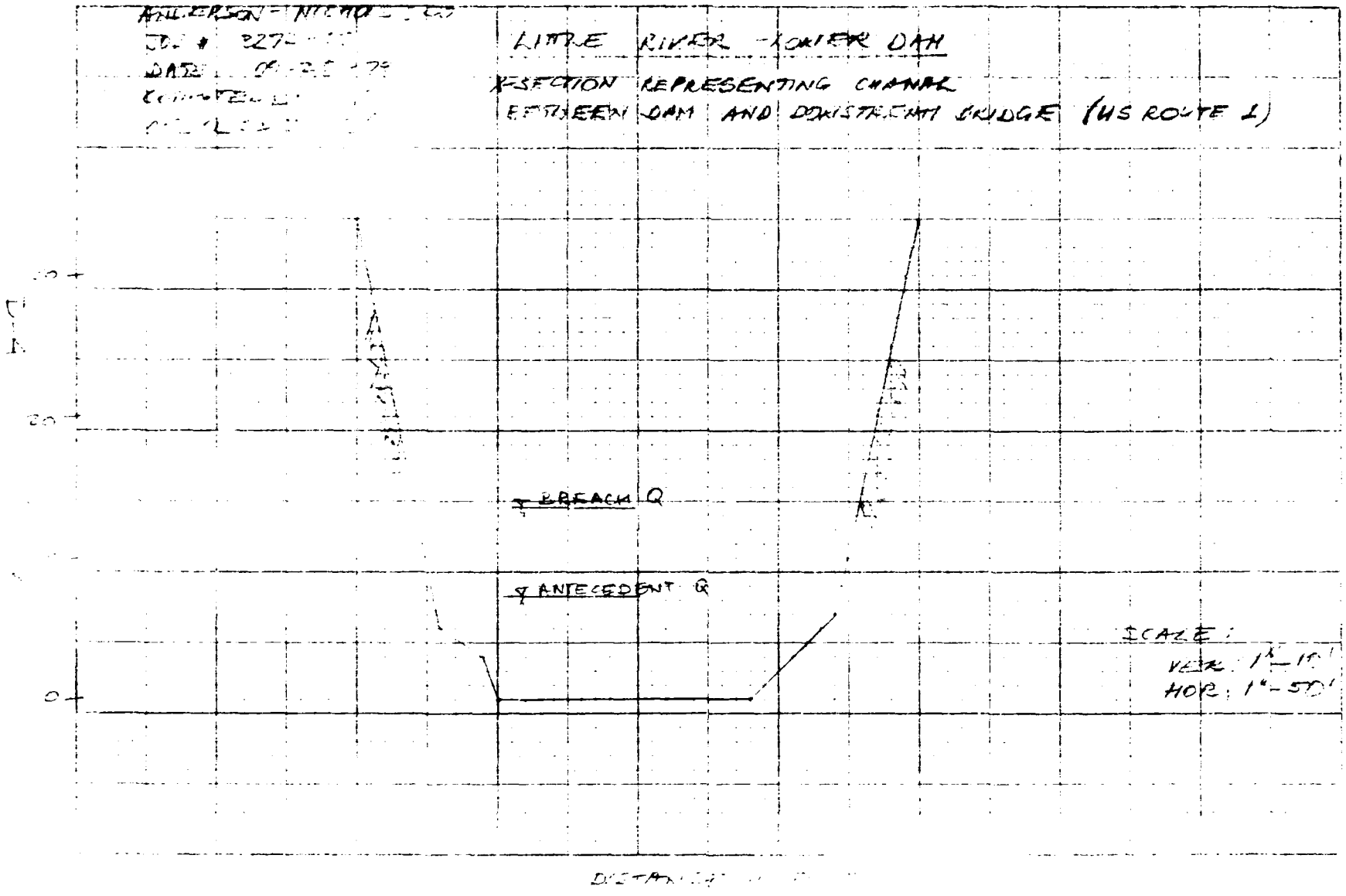
LITTLE RIVER - LOWER DAM - REACH 1
D/S HAZARD RATING CURVE (ABOVE US I 2 BRIDGE)



ANDERSON-NICHOLS & CO.
JOB # 827-
DATE 04-25-79
COMPUTED
CHECKED

LITTLE RIVER - LOWER DAM

XSECTION REPRESENTING CHANNEL BETWEEN DAM AND DOWNSTREAM BRIDGE (US ROUTE 1)



Anderson-Nichols & Company, Inc.

Subject H/H

Sheet No. ____ of ____
Date 10-18-79
Computed ____
Checked LW

JOB NO. 3273-16

LITTLE RIVER - LOWER DAM

BREACH ANALYSIS - CONT'D

REACH #1

USE A TYPICAL CROSS SECTION ALONG THE DOWNSTREAM REACH FROM THE DAM TO THE U.S. ROUTE 1 BRIDGE FOR A DISTANCE OF 400 FEET

DEVELOP A RATING CURVE FOR THIS SECTION BY USE OF MANNING'S EQUATION: $Q = \frac{1.49}{n} \cdot A \cdot R^{2/3} \cdot S^{1/2}$ *

$n = .05$ $S = .0025$

DEPTH [FT]	AREA	WPER	Q [CFS]
4	416	124	1,380
8	969	149	4,974
12	1567	160	10,509
16	2199	172	17,605
20	2864	184	26,150
24	3563	195	36,085
28	4295	207	47,378
32	5062	218	60,016

* 'n' - ROUGHNESS COEFFICIENT
A - AREA OF X-SECTION IN SQUARE FEET
R - A/WETTED PERIMETER
S - SLOPE OF REACH

Anderson-Nichols & Company, Inc. Subject H & H

JOB NO. 3273 - 15 LITTLE RIVER - LOWER DAM

Sheet No. [illegible] of [illegible]
Date 2-28-[illegible]
Computed J.G
Checked [illegible]

SQUARES IN. SCALE

BREACH ANALYSIS

DETERMINE EFFECTS OF BREACH AT TOP OF DAM TO CLASSIFY DOWNSTREAM HAZARD CONDITIONS.

$$Q_p = \frac{8}{27} W_b \sqrt{g} Y_o^{3/2}$$

W_b – BREACH WIDTH

g = 32.2 FT/SEC²

Y_o – POOL ELEV. – ± RIVER BED

W_b = 126 x .4 = 50 ASSUME BREACH WIDTH AT TOP OF DAM = 40.5

Y_o = 30.3 – 1.3 = 29

Q = 13,129 CFS

Q THROUGH SPILLWAY OTHER THAN WHERE DAM BREACHES

L = 91 – 50 = 41 FT

H = 30.3 – 25 = 5.3 FT

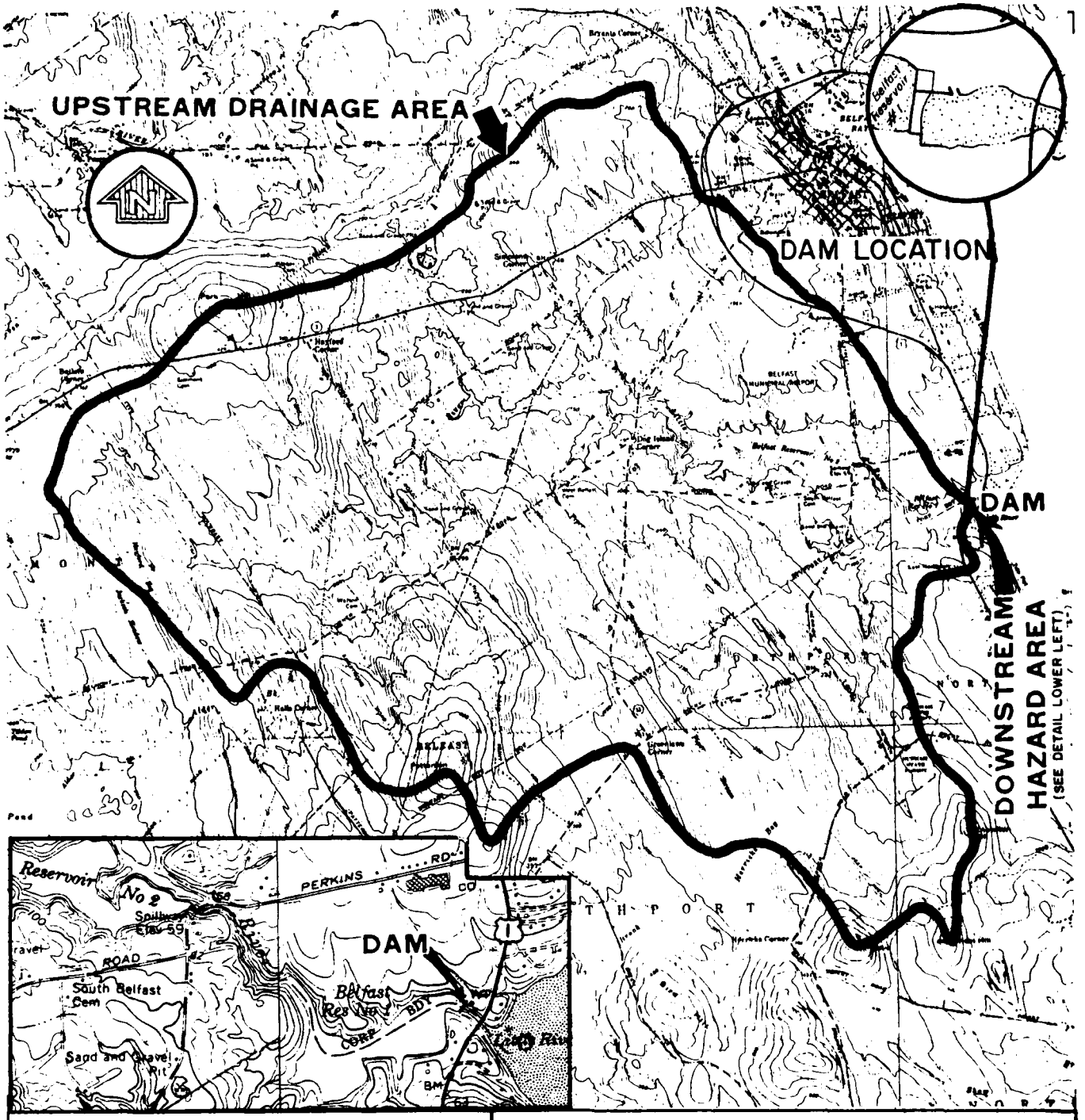
C = 3.3

$Q = C \cdot L \cdot H^{3/2}$ = 1650 CFS

TOTAL BREACH Q = 14,780 CFS

INCIDENT DISCHARGE / SPILLWAY CAPACITY AT TOP OF DAM)

$Q = 3.3 \cdot 91 \cdot 5.3^{3/2}$ = 3005 CFS



NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

LITTLE RIVER LOWER DAM
BELFAST, MAINE

REGIONAL VICINITY MAP

NOVEMBER 1979

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASSACHUSETTS

ANDERSON-NICHOLS & CO., INC CONCORD, N.H.

SCALE IN MILES

0 1 2

MAP BASED ON U.S.G.S. 7.5 MINUTE QUADRANGLE SHEETS. BELFAST, ME., 1960. REVISED 1973. SEARSPORT, ME., 1973. LINCOLNVILLE, ME., 1960, REVISED 1973. ISLESBORO, ME., 1973.

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

September 17, 1979
Figure 12 - Looking downstream at U.S. Route 1 bridge from the north abutment of the dam.

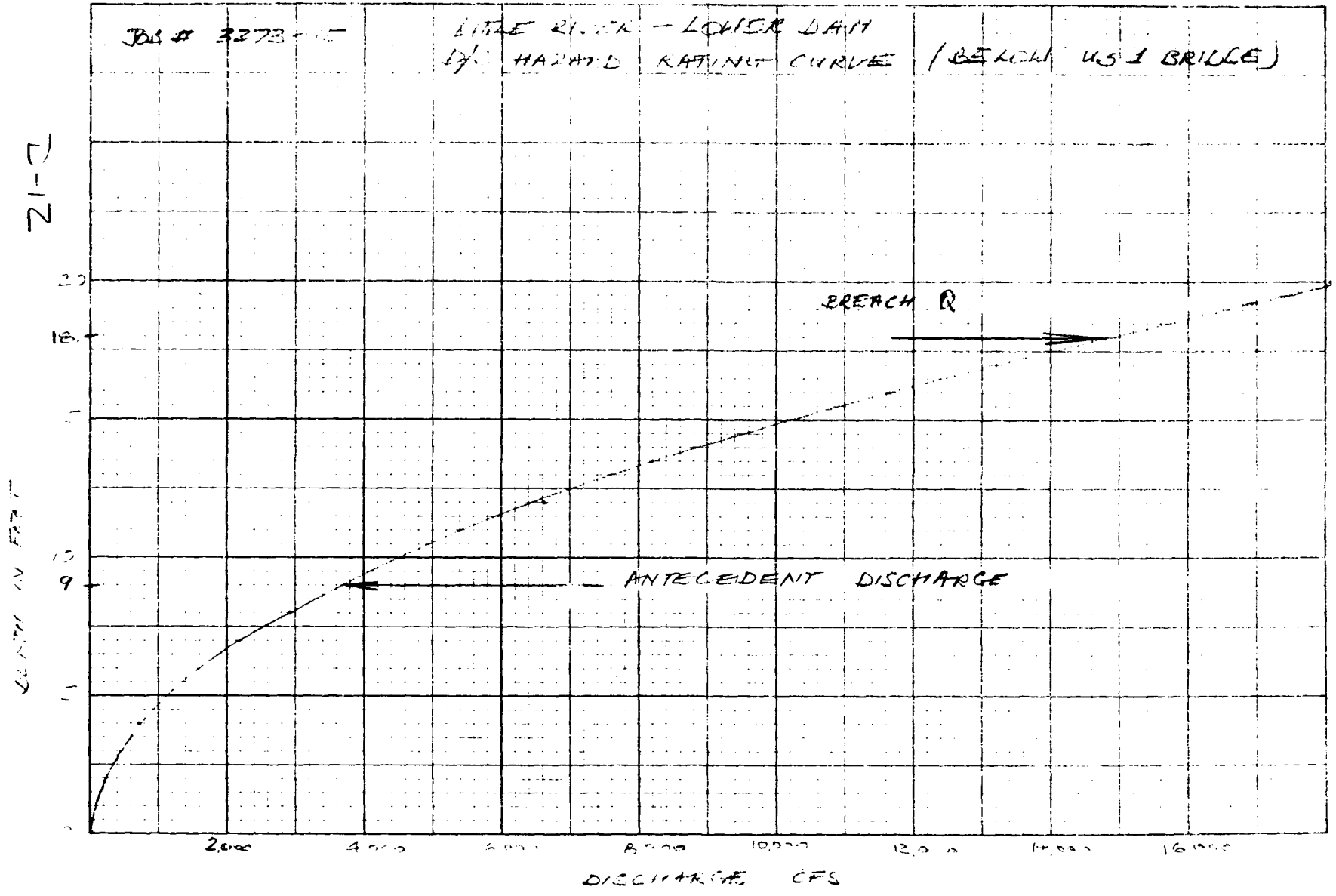
September 17, 1979
Figure 13 - Looking north at downstream channel below the U.S. Route 1 bridge just before confluence with the Atlantic Ocean.

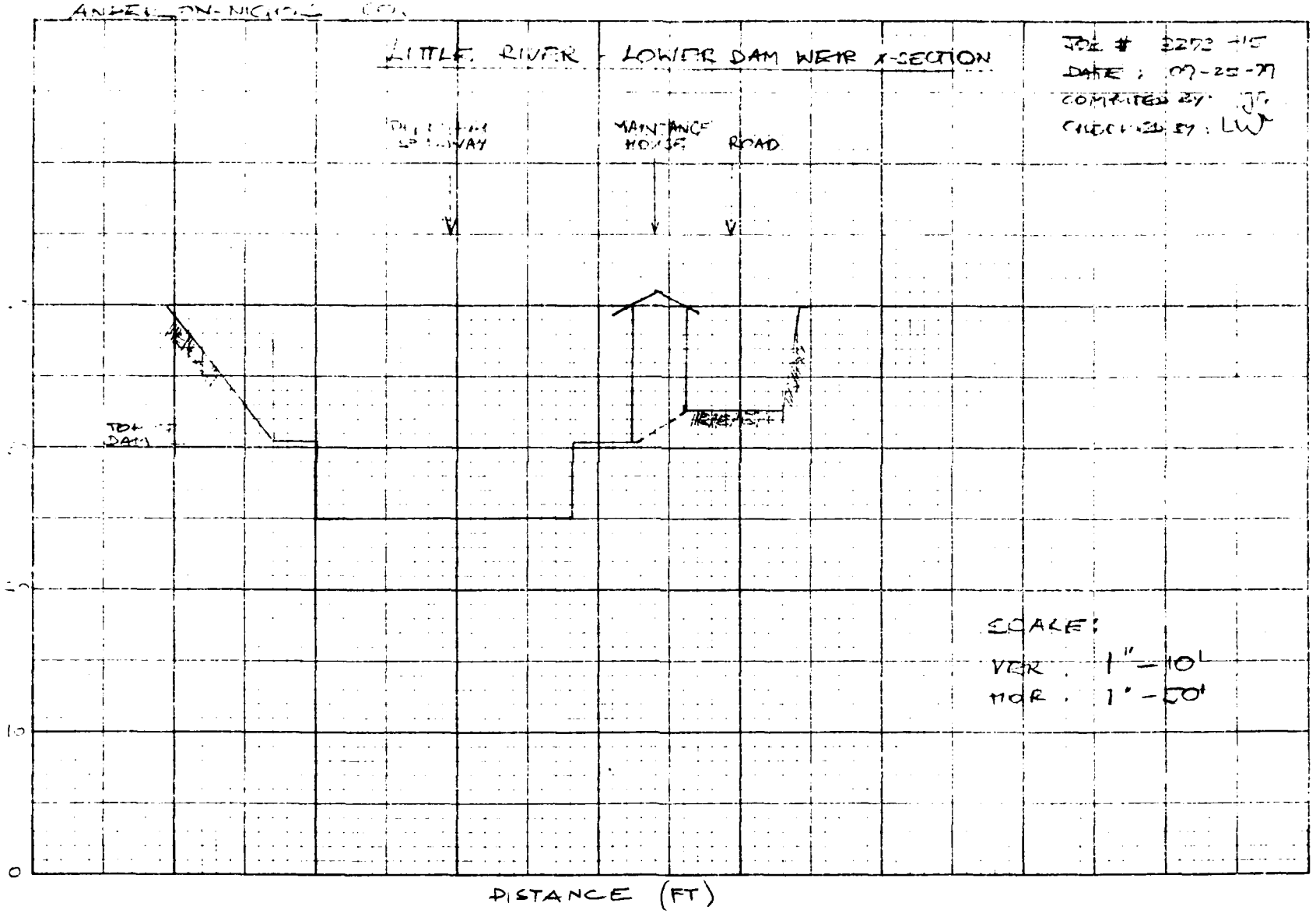
September 17, 1979

Figure 10 - View of the north bank of the downstream channel from the U.S. Route 1 bridge.

September 17, 1979

Figure 11 - Looking upstream at the reservoir from the north abutment.


Job # 3273-C
LITTLE RIVER - LOWER DAM
W/ HAZARD RATING CURVE (BELOW U.S. 1 BRIDGE)
Z1-7
BREACH Q
ANTECEDENT DISCHARGE
18.
9
2,000
DISCHARGE CFS


LITTLE RIVER - LOWER DAM WEIR X-SECTION
JOB # 3272-15
DATE: 07-25-77
COMPUTED BY: JT
CHECKED BY: LW
MAINTANCE ROAD
SCALE:
VER. 1"=10'
HOR. 1"=50'
DISTANCE (FT)
0
10

Anderson-Nichols & Company, Inc.

Subject _____

Sheet No. _____ of _____

Date _____

Computed _____

Checked _____

JOB NO. _____

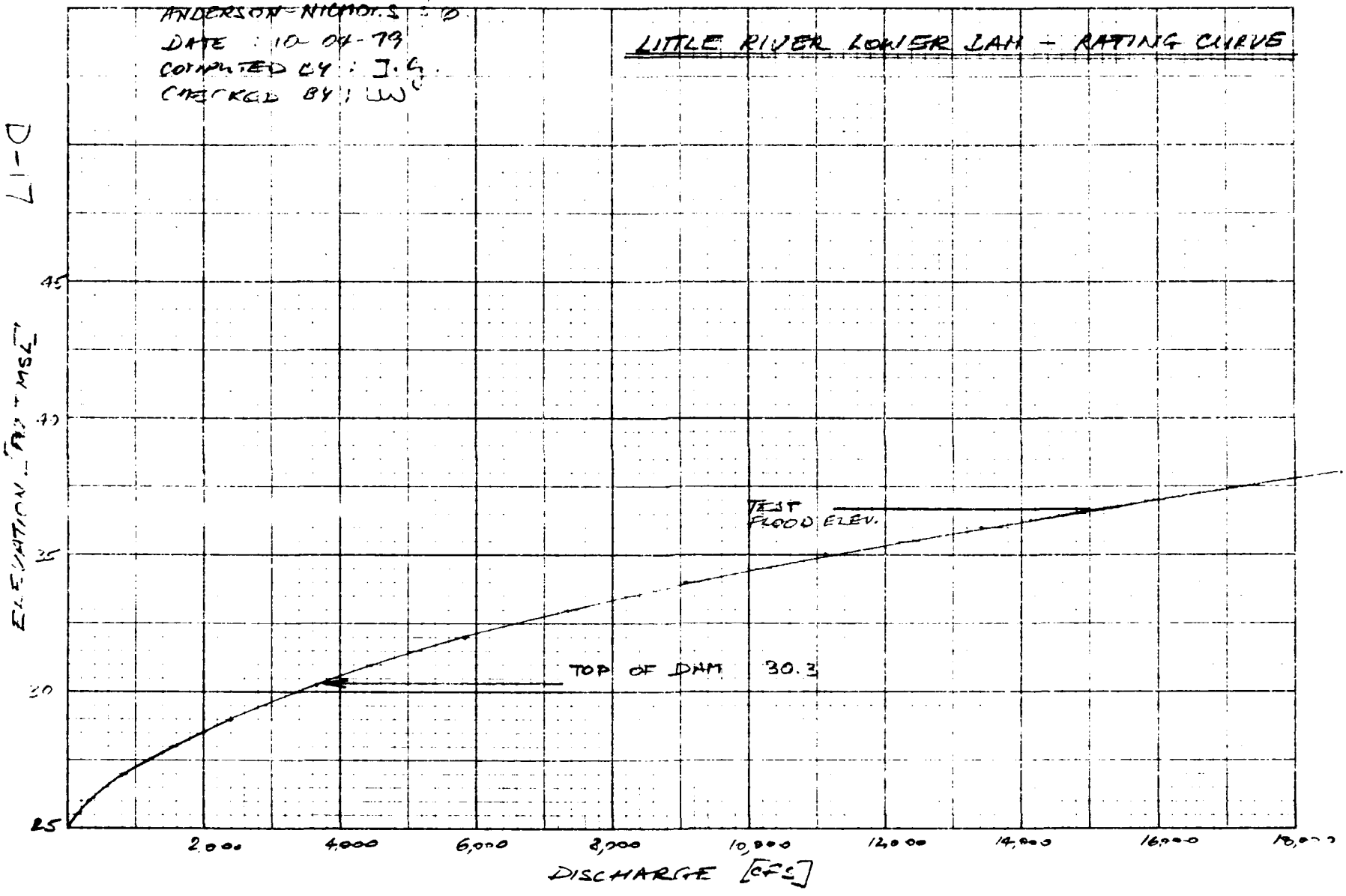
RES 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29

LITTLE RIVER LOWER DAM - RATING CURVE CALCULATION

L-16

ANDERSON-NICHOLS
DATE : 10-04-79
COMPUTED BY : J.G.
CHECKED BY : JW

LITTLE RIVER LOWER DAM - RATING CURVE



derson-Nichols & Company, Inc.

Subject 41-11

Sheet No. ___ of ___
Date ___
Computed ___
Checked ___

JOB NO. 1272 - 17

SCALE 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29

LITTLE [illegible] RESERVOIR DAM

STORAGE - [illegible] CURVE CALCULATION

NORMAL STORAGE (SPILLWAY CREST -20' ETMCL) — 330 AC-FT.

NOTE: 330 AC-FT WAS OBTAINED BY ESTIMATING AVERAGE DEPTH OF RESERVOIR — 10 FEET AND PLANIMETERING SURFACE OF RESERVOIR FROM QUAD SHEET — 81 AC. 135 AC-FT (59 MIL GAL) LISTED AS IMPOUNDING CAPACITY IN APPLICATION FOR DAM REGISTRATION (SEE APPENDIX B) IS NOT REASONABLE.

USING FRUSTRUM OF PYRAMID EQUATION AND PLANIMETERED SURFACE AREAS, [illegible] POINTS FOR A STORAGE - [illegible] CURVE.

$V = \frac{1}{3}(L_1 - L_2)(b_1 + b_2 + \sqrt{b_1 b_2})$

L_1 - ELEV. ABOVE NORMAL POOL.
L_1 - NORMAL POOL SURFACE
b_1 - ENLARGED POOL SURFACE

[illegible] FEET MSL

SURFACE AREA — 46 AC

$V = \frac{1}{3}(20)(0 + 46 + \sqrt{0 \times 46}) = 307$ AC-FT

TOTAL STORAGE — 637 AC-FT

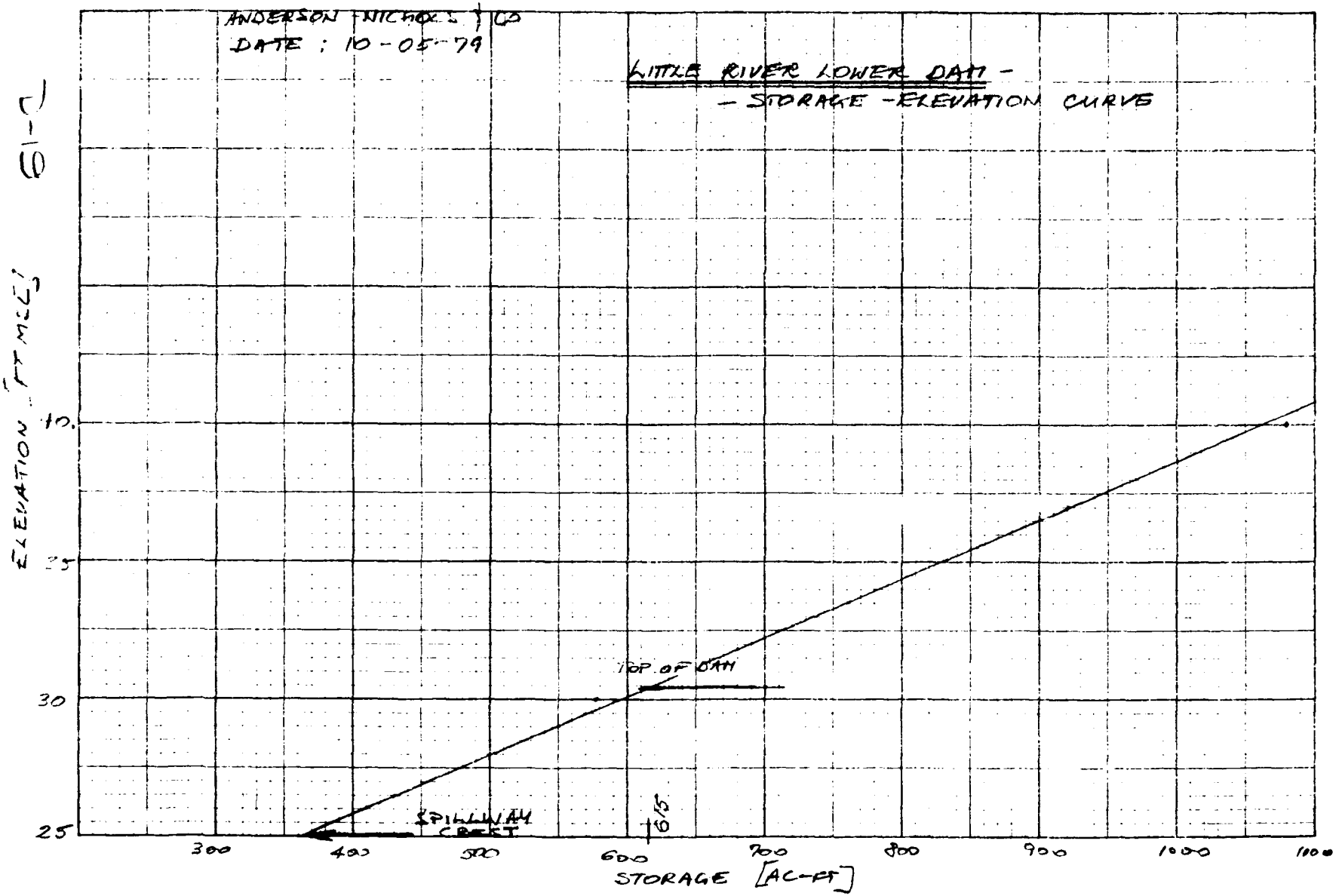
[illegible] MSL

SURFACE AREA — 55 AC

$V = \frac{1}{3}(10)(46 + 55 + \sqrt{46 \times 55}) = 504$ AC-FT

TOTAL STORAGE — 1081 AC-FT

D-18


ANDERSON-NICHOLS & CO
DATE : 10-05-79
LITTLE RIVER LOWER DAM -
- STORAGE - ELEVATION CURVE
ELEVATION [FT MSL]
10
35
30
25
TOP OF DAM
SPILLWAY CREST
615
300
400
500
600
700
800
900
1000
1100
STORAGE [AC-FT]

rson-Nichols & Company, Inc. Subject H & H

Sheet No. ____ of ____
Date 10-16-79
Computed ____
Checked LW

JOB NO. 3273 -16

LITTLE RIVER - LOWER DAM

STEP # 2a

DETERMINE SURCHARGE HEIGHT TO PASS Q_{p_1} of 15,920. TO OBTAIN THIS, A DISCHARGE RATING CURVE MUST BE CALCULATED FOR LOWER RESERVOIR DAM. OUTFLOW WOULD OCCUR FIRST OVER THE PRINCIPAL SPILLWAY. HIGHER FLOOD WATERS WILL FLOW OVER THE DAM EMBANKMENTS AND SIDE SLOPES. SIZE OF EMERGENCY GATE IS UNKNOWN AND HAS NOT BEEN OPENED FOR 20 YEARS. THEREFORE FLOW THROUGH GATE WILL NOT BE INCLUDED IN CALCULATIONS. OUTFLOW THROUGH WATER SUPPLY PUMP WHICH AVERAGES DAILY 215 GPM IS INSIGNIFICANT TO STUDY.

Q_{p_1} = 15,920 CFS ⟹ 37.0 FT MSL

STEP # 2b

DETERMINE VOLUME OF SURCHARGE IN INCHES OF RUNOFF

Q_{p_1} = 15,920 CFS ⟶ 37.0 FT MSL

STORAGE AT 37.0 FT MSL ⟶ 920 AC-FT

STORAGE AT 25.0 FT MSL (SPILLWAY CREST) ⟶ 370 AC-FT

$$550 \text{ AC-FT} \times \frac{1}{16.5 \text{ MI}^2} \times \frac{1 \text{ MI}^2}{640 \text{ AC}} \times 12 \frac{\text{IN}}{\text{FT}} = .61'' \text{ RUNOFF (STOR 1)}$$

STEP # 2c

$$Q_{p_2} = Q_{p_1} \times \left(1 - \frac{\text{STOR 1}}{9.5''}\right)$$

$$Q_{p_2} = 15{,}920 \text{ CFS} \times \left(1 - \frac{.61''}{9.5''}\right) = \underline{14{,}900 \text{ CFS}}$$

(L-10)

Anderson-Nichols & Company, Inc. Subject H & H

Sheet No. ____ of ____
Date 10-16-79
Computed ____
Checked W J.G.

JOB NO. 3273-16

LITTLE RIVER - LOWER DAM

STEP # 3a

DETERMINE SURCHARGE HEIGHT TO PASS Q_{P2}

Q_{P2} = 14,900 CFS → 36.6 FT MSL → 900 AC-FT

$530 \text{ AC-FT} \times \frac{1}{16.8 \text{ MI}^2} \times \frac{1 \text{ MI}^2}{640 \text{ AC}} \times 12 \frac{\text{IN}}{\text{FT}} = .59''$ RUNOFF (STOR 2)

STEP # 3b

AVERAGE STOR 1 & STOR 2

$\frac{.61'' + .59''}{2} = .60''$ RUNOFF

$.60'' \times \frac{16.8 \text{ MI}^2}{1} \times \frac{640 \text{ AC}}{1} \times \frac{1}{12} \frac{\text{FT}}{\text{IN}} = 538 \text{ AC-FT}$

538 AC-FT + 370 = 908 AC-FT

908 AC-FT → 36.7 FT MSL ⇒ 15,000 CFS

TEST FLOOD — ½ PMF

TEST FLOOD DISCHARGE — 15,000 CFS (@ 36.7' MSL)

TOP OF DAM — 30.2 (FT MSL) THEREFORE DAM EMBANKMENT WOULD BE OVERTOPPED BY ABOUT 6.4 FT DURING TEST FLOOD CONDITIONS.

TOP OF DAM — 30.2 FT MSL — STORAGE 615 AC-FT.

SPILLWAY CAPACITY @ TOP OF DAM IS 3665 CFS WHICH IS EQUIVALENT TO 24 PERCENT OF THE TEST FLOOD.

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

STATE	NATIONAL ID NUMBER	DIVISION	STATE	COUNTY	CONGR DIST	STATE	COUNTY	CONGR DIST	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE DAY	MO	YR
ME	2844	NED	ME	027	01				LITTLE RIVER LOWER DAM	4427.7	6859.4	05	NOV	79

POPULAR NAME	NAME OF IMPOUNDMENT
LOWER DAM	BELFAST RESERVOIR NUMBER 1

REGION	BASIN	RIVER OR STREAM	NEAREST DOWNSTREAM CITY-TOWN-VILLAGE	DIST FROM DAM (MI)	POPULATION
01	03	LITTLE RIVER	NORTHPORT	1	1000

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STRUCTURAL HEIGHT (FT)	HYDRAULIC HEIGHT (FT)	IMPOUNDING CAPACITIES MAXIMUM (ACRE-FT)	IMPOUNDING CAPACITIES NORMAL (ACRE-FT)	DIST	OWN	FED R	PRV/FED	SCS A	VER/DATE
CT-EOT	1943	S	31	30	915	370	NED	N	N		N	

REMARKS

21-DOWNSTREAM STONE WALL

D/S HAS	SPILLWAY LENGTH (FT)	SPILLWAY TYPE	SPILLWAY WIDTH (FT)	MAXIMUM DISCHARGE (FT³/S)	VOLUME OF DAM (CY)	POWER CAPACITY INSTALLED (MW)	POWER CAPACITY PLANNED (MW)	NAVIGATION LOCKS NO.	LENGTH (FT)	WIDTH (FT)	LENGTH (FT)	WIDTH (FT)	LENGTH (FT)	WIDTH (FT)	LENGTH (FT)	WIDTH (FT)
2	120	U	91	3665												

OWNER	ENGINEERING BY	CONSTRUCTION BY
BELFAST WATER DISTRICT		

REGULATORY AGENCY

DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE

INSPECTION BY	INSPECTION DATE DAY	MO	YR	AUTHORITY FOR INSPECTION
ANDERSON-NICHOLS & COMPANY INC	17	SEP	79	PL 92-367

REMARKS

END

FILMED

8-85

DTIC